# INTERNAL COMBUSTION AEOLIPILE

## BACKGROUND

Since jet nozzles can extract mechanical energy from expanding combustion gases at much higher temperatures than turbine blades, the compression and fuel/air ratios may be greatly increased in an engine that expands combustion gases through a nozzle instead of the conventional axial turbine. Higher temperatures provide higher efficiencies and, in the aircraft engine embodiment, allow much higher top end speeds for aircraft and missiles compared to current turbojet engines. The problem is to obtain rotational shaft work to drive the compressor and generators by expanding a gas through one or more nozzles.

## BRIEF SUMMARY OF THE INVENTION

In the present invention an aeolipile attached to an annular rotor internal stator compressor replaces the axial turbine of gas turbine engines. Rotational shaft work in the reaction turbine is produced from expanding the combustion gases directly through a plurality of jets or nozzles tangential to the circumference of the rotating engine. The annular rotor of the compressor is spin balanced along with the combustion chamber and the rest of the rotating engine while the stator houses the fuel line, hydraulics, electrical lines and other control systems. The engine is mounted wholly or in part on the compressor stator axle.

## DESCRIPTION OF THE DRAWINGS

FIG. 1 is a cross section of an embodiment of the engine with a turbine 8 to recover additional energy from the jets 2. The jets rotate the engine which is attached to compressor rotor 6 supported by load bearing bladed wheels 22 mounted on the stator axle 24. Air enters the compressor at 20 and then mixes with fuel from fuel nozzles 14 in the combustion chamber 12. After combustion the gases expand through the jets. Fuel, electrical and other lines enter the engine through the open end of the stator axle 16. The turbine may be reverse geared to the aeolipile through gear box 10 so all the shaft work leaves through drive shaft 18.

FIG. 2 is a cross section of an aircraft "aeolifan" embodiment of the engine. Gases leave combustion chamber 52 and exit through the aeolipile jets 42 to drive the compressor and fan and, depending on how the main jet control 58 is set, for forward thrust. Air enters the annular area 62 for the fan or into the compressor intake 62. The entire engine is mounted on the stator axle 56.

FIG. 3 is a cross section of an embodiment of the engine with tip mounted combustion chambers 94. Fuel is delivered through the axle 96 to the combustion chambers by rotating fuel lines and by a means 80 to distribute the fuel from the stationary axle to the rotating lines.

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Bret Cahill
P. O. Box 6322
Beaumont, TX 77725
409-833-2741
BretCahill@aol.com

# Numbers in Fig. 4. of External Rotor Gas Turbine
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The numbers in Fig. 4 correspond to these parts:

| Number | Part |
|---|---|
| 102 | single stage expansion nozzle on 100% reaction turbine |
| 104 | cascaded diffuser vane |
| 106 | composite fiber rotor element of centrifugal compressor |
| 108 | 100% impulse turbine bucket |
| 112 | combustor area |
| 116 | fuel, ignition, control and other lines |
| 118 | drive shaft output from reducer |
| 120 | intake air for two stage centrifugal compressor |

## Brief Description of Fig. 4

FIG. 4 is a cross section of an embodiment of the engine with a single stage 100% impulse turbine 108 to recover the kinetic energy remaining in the jets of combustion gases expanding through nozzles 102. The jets also provide torque to rotate the reaction turbine which is attached to centrifugal compressor rotor 106. Intake air 120 enters the two stage compressor and is accelerated in the radial direction by the impeller, then undergoes compression in the cascaded diffuser 104 attached to the stator. The compressed air then mixes with fuel in the combustion chamber 112. After combustion the gases expand through the nozzles 102. Fuel, electrical and other lines enter the engine through the open end of the stator axle 116. A reducer then increases torque for drive shaft 118.